

FORUM

The new Checklist of British Columbia Lepidoptera and how it came to be

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The Entomological Society of British Columbia (ESBC) is publishing a new checklist of the Lepidoptera of British Columbia as the third volume in the ESBC's Occasional Papers series (Pohl et al., in press). Occasional Paper No. 1, published in 1951, was "An annotated check list of the macrolepidoptera of British Columbia" by J. R. J. Llewellyn Jones. Llewellyn Jones was an active ESBC member who willed some of his estate to the Society so that insect lists and other projects might be published for the good of British Columbia (B.C.) entomology. It is an appropriate and historic gesture for the ESBC to publish the next major list of British Columbia moth and butterfly species more than 60 years later. The 1951 list proved to be a significant entomological milestone and we are convinced that ours will be an influential one, too. The list's authors are Greg Pohl (Natural Resources Canada, Northern Forestry Centre, Edmonton, AB), Rob Cannings (Royal British Columbia Museum [RBCM], Victoria, B.C.), Jean-François Landry (Agriculture and Agri-Food Canada, Canadian National Collection of Insects, Arachnids and Nematodes [CNC], Ottawa, ON), David Holden (Canadian Food Inspection Agency, Burnaby, B.C.), and Geoff Scudder (University of British Columbia [UBC], Vancouver, B.C.).

The list documents 2,757 Lepidoptera species reported for B.C. The data are based on literature records and examination of the major public insect collections in the province and the CNC. The classification and nomenclature follow the most recent phylogenetic hypotheses for the order, and captures nomenclatural changes to the end of September 2013. We include records from relevant literature published since 1950 and from selected older works, such as previous

B.C. checklists and significant taxonomic revisions. The list supplies taxonomic, distributional and biological notes for selected species; we list an additional 30 species that probably occur in B.C. and consider 126 species to be introduced from outside North America. Also included is a list of 294 species erroneously reported from B.C. in previous works: this important section of the manuscript clears up previous misidentifications and errors, many of which have persisted in the literature for decades. Introductory sections give an overview of the order, review the ecozones of the province, and discuss the history of lepidopterology in B.C. and our current state of knowledge. We review each of the 68 families occurring in B.C., providing information on distinguishing features, biology and diversity. An index to the higher taxonomic names, genera, species and common names is included.

Species lists such as this answer the fundamental question: "What lives here?" As a foundation for other biological research, such lists are the first step on a continuum of exploration into what these species do and how they interact with other species. The new B.C. Lepidoptera checklist will be a significant and useful resource for anyone studying the Lepidoptera of the province, including resource and conservation managers, biodiversity researchers, taxonomists, naturalists and amateur collectors. Although other lists have been published on portions of the butterfly and moth fauna, none is as comprehensive as this one, which represents a major step forward in our understanding of the Lepidoptera fauna of the province.

The list had its beginnings as something else entirely. In the late 1990s, Geoff Scudder and Rob and Syd Cannings embarked on a

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project to produce online overviews and user-friendly, illustrated identification keys to about 505 insect families and 29 insect orders in B.C. Launi Lucas, Geoff's assistant at UBC, coordinated much of the project, drew illustrations, and prepared the material for the Internet. For several years, the "Insect Families of British Columbia" project was funded by Forest Renewal B.C. and its subsequent incarnations (Forest Innovation Investment and the Forest Science Program). Initially, the project results were posted on a website hosted by the Zoology Department at UBC, but by 2007 this had migrated to *E-Fauna BC* to form core entomological content there.

Geoff and Rob created the initial draft of the Lepidoptera list so that they could write a brief summary of the diversity of each BC moth and butterfly family for the "Insect Families of B.C." Don Lafontaine of the CNC provided the original species list in 2005. By 2007, the Lepidoptera account was complete and posted on the Internet (Cannings and Scudder 2007a, 2007b).

In 2009, Greg Pohl brought his expertise and experience on Lepidoptera to the list. Beginning with a submission of additional micromoth names, Greg's involvement grew and he eventually became the list's coordinator. He delved deeply into literature and collection records to produce a more comprehensive treatment, with greater taxonomic detail and updated nomenclature. His contribution was critical, as he had already been amassing species names, collection details, literature, and other important data on B.C. moths, especially micromoths, as part of ongoing research on the western Canadian fauna. To add more expertise in micromoths and to link the list more firmly to the national data, Jean-François Landry joined the team in 2012. A year later, David Holden also became an author, bringing considerable B.C. experience and knowledge to the project. The additional authority these participants offered was immense: about 450 species were added to the 2007 list, and the knowledge of many of their colleagues was incorporated into the data.

The challenge of compiling the information was straightforward but daunting: to extract records of Lepidoptera that may occur in B.C. from all relevant taxonomic

publications, and from specimens in public collections with significant B.C. holdings. Butterfly information was largely based upon the definitive works by Layberry et al. (1998), Guppy and Shepard (2001) and Pyle (2002). For macromoths, we drew upon Troubridge and Lafontaine's *Moths of Canada* website (CBIF 2003) and various fascicles in the *Moths of North America* series, but have also examined virtually all North American taxonomic works published since 1950 and many from before. For micromoths, we checked almost every North American taxonomic publication since 1900, and a few earlier ones. All these literature records were then augmented with previous provincial lists, regional lists and specimen data from the RBCM, the Beaty Biodiversity collection at UBC, the Canadian Forest Service–Pacific Forestry Centre collection, the CNC in Ottawa, and several other regional collections across Canada. Some curators were able to provide species lists for us; we visited other collections to extract the records ourselves. Most of this was done over several years by Greg, with assistance from summer student Christi Jaeger. As well, Rémi Hébert, Scientific Project Coordinator for the General Status of Species in Canada (Environment Canada), stepped in with critical funds for contracts to extract records from some large historical monographs and from specimens in the UBC collection and the CNC. All these activities brought together the vast majority of the required data. To produce the current list, we compiled all the records organised by a nomenclatural database built by Greg from the taxonomic papers examined. We then ground-truthed the list by flagging questionable records and by checking the identities of selected specimens. The resulting list was examined by a number of experts and then vetted again by anonymous reviewers for the *Journal of the ESBC*.

Greg and Rob wrote an introduction putting the contents of the list in biological, geographical, historical and taxonomic contexts. An overview of the Lepidoptera was excerpted from the order account that Rob had prepared for the material now online on *E-Fauna BC*. Rob also wrote a summary of the ecozones of B.C. as an overview of the province's environment. Greg summarized the history and current state of Lepidoptera

research in B.C. and described the format and content of the checklist. He also prepared the index, the reference section, and the list of excluded taxa.

As authors of the list, we are primarily compilers and editors of scattered information; we owe a huge debt to the curators of our public collections and the taxonomists who described and revised all the species listed. We also acknowledge historical workers such as George W. Taylor, E. M. Anderson, Ernest H. Blackmore and James R. J. Llewellyn Jones, as well as more recent researchers and collectors such as Libby Avis, Cris Guppy, Dean Nicholson, Jon Shepard and Jeremy

deWaard. This list would not exist without their efforts.

Our intent is to make a PDF of the complete list available on the ESBC and RBCM websites and on *E-Fauna BC*. We have a large spreadsheet of literature records and collection holdings that formed the basis of the species list, and we also hope to make that available online. We encourage users of the list to verify uncertain entries and to look for gaps and omissions that will motivate them to survey poorly known habitats and discover new records. Dave Holden³ will compile additions and corrections to the list and will disseminate future updated versions.

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